PARTS SPECIFICATION

CODE IDENT NO. 23835
SPEC NO. CS516007 REV A
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DATED.

RESISTORS,FIXED,METAL ELEMENT,(POWER TYPE), (VERY LOW RESISTANCE VALUES), GENERAL SPECIFICATION FOR

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LIST

1. SCOPE

1.1 Scope. Delete and substitute as follows:

1.1 Content. This document establishes the general manufacturing and testing requirements for resistors, metal element, (power type), (very low resistance values). MIL-R-49465 is used as the baseline; this document lists exceptions to MIL-R-49465 and adds requirements to make it suitable for the acquisition of resistors to meet the quality and reliability requirements of JPL mission class A and B procurement. Detail requirements, specific characteristics of resistors and other provisions which are sensitive to the particular use intended shall be specified in the applicable detail specification. This document is not intended for qualification of parts (inclusion in the qualified products list, QPL) as defined by MIL-R-49465.

Add the following paragraph:

1.1.1 Format. The format of this specification is called the exceptions style. It is based on the MIL-R-49465 specification with the listings on the CS516007 drawing being exceptions or additions to the MIL-R-49465 military specification.

1.2.1 Military part number. Delete and substitute the following.

1.2.1 Part number. The part number shall be marked in accordance with the JPL detail specification.

2. APPLICABLE DOCUMENTS

2.1.1 Specifications, standards and Handbooks. Delete and substitute the following: The requirements of the following documents, of the issue indicated, form a part of this specification unless exceptions are noted herein, in the detail specification, or in the procurement document. The contractor may contact the JPL negotiator to obtain copies of these documents.

SPECIFICATIONS

Military

Add the following:

MIL-R-49465 Resistors, Fixed, Metal element,(Power Type), (Very low resistance Value), General Specification for.

Add the following paragraph:

2.1.2 Exceptions. References to the U.S. Government and its agencies shall be taken to refer to JPL. The detail specification shall be the JPL detail specification. Requirements for qualification apply only to QPL listed resistors.

2.2 Order of precedence. Delete and substitute as follows: In the event of conflict between the requirements of this document and other requirements, the precedence in which requirements shall govern, in descending order, is as follows:

a. Procurement document (contract or purchase order)

b. Applicable device specification (associated detail specification or drawing)

c. This specification

d. Specification and standard referenced in 2.1

Add the following:

2.3 Terms and definitions.

2.3.1 Contract technical manager. The contract technical manager shall be the principal technical interface between the manufacturer and JPL.

2.3.2 Control unit. A control unit is a part which is not subjected to any of the stresses that are applied to the test specimens and is used to verify the repeatability and accuracy of measurements. Use of secondary standards is acceptable.

2.3.3 Trace number. The trace number is the number assigned by the procurement document to link a part number to a specific purchase order or order release.

2.3.4 Screening. Screening consists of the tests performed on 100% of the resistors (table VI herein). It includes the MIL-R-49465 group A subgroup 1, 2, and 3 inspections.(See 3.29 herein).

2.3.5 Technical direction. Technical direction shall mean written direction, usually on a JPL technical direction memorandum (TDM) form.

3. REQUIREMENTS

3.2 Qualification. Delete and substitute as follows: If the resistor styles are QPL listed, the manufacturer shall provide a copy of the data required in MIL-R-49465 paragraph 4.4 for qualification or retention of qualification. The data shall be for the most recent qualification test preceding delivery of the JPL resistors.

3.4 Design and construction. Add the following: The manufacturer shall advise the JPL contract technical manager of any changes in design and construction.

3.11 Thermal shock. Delete and substitute the following: When resistors are tested as specified in 4.7.5, there shall be no evidence of mechanical or electrical damage. The change in resistance shall not exceed ±(0.5 percent + 0.01 ohm.).

3.24 Marking. Delete and substitute as follows: Each resistor shall be marked, as a minimum, as indicated below and as specified in the detail drawing:

a. JPL part number in accordance with detail specification

b. Manufacturer's logo or name

c. Manufacturing date code

d. Serial number

ST/PT SPECIFICATION NUMBERING SYSTEM

ST12136	R	W	A	S	R0050	F
BASIC DWG. No.	**PART TYPE** R=RESISTOR	**ELEMENT** C=CARB.COMP.	**CONFIGURATION** A=AXIAL	**CHARAC/CALIB. -PART TYPE R-**	**RESISTANCE** (See note)	**TOLERANCE** V=0.005

M=SENSORS & THERMISTORS	F=CARB.FILM	B=BEAD	Y= 10 PPM	T=0.01
	M=METAL FILM	C=CHIP	E= 25 PPM	Q=0.02
	W=WIRE	D=DIP	H= 50 PPM	A=0.05
	S=SPECIAL	F=FLAT PACK	K=100 PPM	B=0.1
		H=HYBRID PACK	M=300 PPM	D=0.5
		R=RADIAL	S=SPECIAL	F=1
		S=SPECIAL	**-PART TYPE M-**	G=2
			A=-180 to 500°C	J=5
			B=-260 to 0°C	K=10
			C=-260 to 500°C	S=SPECIAL
			D= 0 to 200°C	
			E= 0 to 500°C	
			F= 0 to 800°C	
			G= 0 to 660°C	
			K= 19.8 %	
			L= 29.4 %	
			M= 48.7 %	
			N= 0.5 %	
			S=SPECIAL	

NOTE: Five character resistance designation. The five character resistance designation is applicable to all resistance tolerances. The nominal resistance is identified by five digits. The letter "R" should be substituted for one of the significant digits to represent the decimal point. The succeeding digits of the group represent significant figures. The standard resistance values for each decade should follow the sequence demonstrated for the 0.01 to 0.1 decade in table II of MIL-R-49465 for all resistance tolerances. Only those resistance values which follow the sequence of values listed in the 0.01 to 0.1 decade in table II of MIL-R-49465 should be considered as conforming to this specification. The resistance value designations are shown below.

If size does not permit the ST in the part number may be omitted.

Designation of resistance values

Designation	Resistance
R0100 to R0976 inclusive	.0100 to .0976 inclusive
R1000 to R9760 inclusive	.1000 to .9760 inclusive
1R000	1.000

Add the following paragraphs:

3.27 JPL review of manufacturer's documentation. The manufacturer shall make available the lot traveler(s) and process sheets for each part style (covering assembly, screening, forming, and, if required, QCI operations) for review and approval during the plant survey prior to use with their respective lots.

3.28 Data required with shipments. Data shall be identified by part number, lot number, trace number, and serial numbers. The following data shall be included with each shipment of screened parts:

a. A copy of qualification or qualification retention data (for resistors which are QPL listed)

b. Electrical test data for all specified tests, including control unit data and delta calculations

c. Data for any other special tests required by the detail specifications or procurement document

d. Copies of reports on any failure analysis or engineering evaluations performed by the manufacturer

e. Copies of any waivers or technical direction memoranda (TDMs) altering the specified requirements

f. Certificate of conformance to the requirements of this specification, signed by the manufacturer's authorized representative.

g. Radiographic film shall be submitted with the parts. A method shall be used to identify each resistor to each image on the film.(The serial number would be the preferred method.)

h. If tests are labeled with test numbers, a cross-reference shall be provided to relate test numbers to descriptive test name. It is preferred that printed electrical test data be formatted such that all measurements of a given parameter are displayed in a column, in serial number order and two copies of the printed data shall be provided. Electrical test data when required by the contract or purchase order shall be provided in a magnetic medium. Either IBM DOS-compatible 5-1/4" or 3-1/2" diskette with data in ASCII format or 9-track tape (800 or 1600 bpi) with data in ASCII or EBCDIC format may be provided.

3.29 Serialization. Parts shall be serialized prior to the first electrical test.

3.30 Problem notification. The contractor shall notify the JPL contract technical manager within two working days of the occurrence of any of the following:

a. Any catastrophic failure after initial electrical test.

b. Any screening failures in excess of 10 percent of the total lot being screened, including failures which appear to result from equipment failure or operator error.

c. Any (lot sample) QCI failure.

d. Any need for remarking serial numbers.

e. Any failure of qualification retention test.

3.31 Failure analysis. JPL retains the option of performing any failure analysis. The manufacturer shall not do any destructive analysis of the parts without prior consent of the JPL contract technical manager. If there is a catastrophic failure, the JPL contract technical manager shall be notified within two working days.

3.32 Status reporting. When requested, the contractor shall provide the JPL contract negotiator with an oral or written status report stating the current status and expected ship date of each lot in process, and noting any significant problems.

3.33 Conditioning. When resistors are tested as specified in 4.7.19, there shall be no mechanical damage. The change in resistance shall not exceed ±(0.2 percent +.01 ohm).

3.34 Radiographic inspection. When resistors are inspected as specified in 4.7.20 herein there shall be no evidence of defects which will effect reliability or performance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Delete and substitute the following: JPL engineering and QA may perform a survey to ascertain compliance with the requirements of this specification. Information regarding recent DESC audits, if any, shall be made available upon request. Any deviation in test method must be approved by technical direction from the JPL contract technical manager before the deviation is implemented.

Add the following paragraph:

4.1.2.1 Control Units/Calibration.

a. Control unit: A control unit shall be measured and recorded immediately before and after each set of electrical measurements of the test specimens. (It is preferred that the same control units be used for all JPL lots of the same device type.) Each set of control unit measurements shall be checked for consistency with the last prior set of control unit measurements before proceeding with testing of the lot. In the event of significant discrepancy between two sets of readings, corrective action (maintenance or re-calibration of the test equipment) and retest of control units shall be accomplished before proceeding with testing of the lot. Any variations due to re-calibration shall be noted.

b. Test equipment calibration program: A calibration recall program shall be in place. Signed and dated records of calibration shall be made available to JPL quality assurance representatives upon request.

4.4 Qualification inspection. Add the following: This section applies only to resistors which are QPL listed.

4.6.1 Inspection of product for delivery. Delete and substitute as follows: Inspection of product for delivery shall consist of the tests and inspections listed in table VI.

4.6.1.1. Inspection lot. Delete and substitute as follows: An inspection lot shall consist of all resistors screened together in accordance with this specification. Each device shall be serialized and shall be traceable to the inspection lot and date code.

4.6.1.2 Group A inspection. Change to screening inspection.

Delete table VI, Group A inspection, and substitute as follows:

TABLE VI. SCREENING INSPECTION

Inspection	Requirement Paragraph	Test Method Paragraph	Sampling Procedure
SUBGROUP 1			
Visual and mechanical	3.1, 3.3 to 3.4.1.3, 3.24 to 3.26	4.7.1	100 percent inspection
Radiographic inspection	3.34	4.7.20	
Thermal shock	3.11	4.7.5	
Short time Overload	3.14	4.7.8	
Conditioning	3.33	4.7.18	
Radiographic Inspection	3.34	4.7.20	100 percent test

4.6.2 Periodic inspection. Add the following note: This section applies only to QPL listed fixed film resistors.

4.7.1 Visual and mechanical inspection. Add the following: Visual inspection shall be performed at a minimum magnification of 15X.

4.7.2 DC resistance. Add the following subparagraphs:

e. Bridge measurement accuracy: Bridge measurement accuracy shall be ±(0.2% +0.05 ohms). Repeatability shall be ±0.01%.

f. Measurement precision (resolution): All measurements shall be recorded to five significant figures.

Add the following paragraphs:

4.7.18 Conditioning. Resistors shall be conditioned in accordance with method 108 of MIL-STD-202. The following details and exceptions shall apply:

a. Method of mounting: Supported by their terminal leads (resistors not mounted on life test chassis). Resistors shall be so arrange that the temperature of any one resistor shall not appreciably influence the temperature of any other resistor. There shall be no undue draft on the resistors. Contact shall not be made by soldering the parts. Any method that makes a secure contact is acceptable.

b. Temperature and tolerance: +25°C, +10°C, -0°C.

c. Initial measurements: Initial resistance shall be measured after mounting at +25°C, +10°C, -0°C.

d. Operating conditions: Rated DC continuous working voltage or rated continuous working voltage from an AC supply at commercial line frequency and wave form, shall be applied intermittently 1.5 hours on and 0.5 hours off for 168, +12, -0 hours at a temperature of +25°C, +10°C, -0°C. Each resistor shall dissipate a wattage equal to the power rating (free air) of the resistor.

e. Measurement after conditioning: Resistance shall be measured at the end of 168, +12, -0 hours at +25°C, +10°C, -0°C, as specified in 4.7.2 after load has been removed and the resistors stabilized at room temperature.

f. Examination after conditioning: Resistors shall be examined for evidence of mechanical or electrical damage.

g. Resistors shall be wired so that the rated voltage is applied simultaneously and continuously across all resistors.

4.7.20 Radiographic inspection. Radiographic inspection shall be performed in accordance with MIL-STD 202, method 209. The following details shall apply:

a. Two views shall be taken, with one view rotated 90°C from the other view.

b. Fine grain film such as Kodak type "R" shall be used.

c. There shall be no evidence of foreign or loose particles in the resistor and the end caps shall be straight within 10°.

5. PACKAGING.

Add the following paragraphs:

5.2 Marking of container. Add the requirement for marking the initial container (unit package, e.g. tube or bag) with the JPL trace number.

5.3 Packing slips and invoices. The packing slip and invoice shall include the JPL trace number associated with each line item.

6. NOTES. Delete entirely.

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